W. E. SHIVELY AND K. B. KILBORN.

AUTOMATIC VALVE CONTROLLER.

APPLICATION FILED MAR. 6, 1918.

1,317,668.

Patented Sept. 30, 1919.

2 SHEETS—SHEET 1.

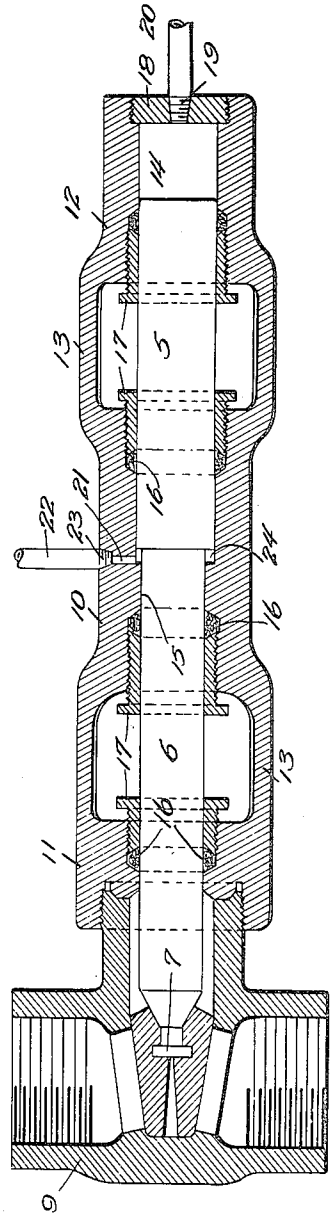


FIG. 1.

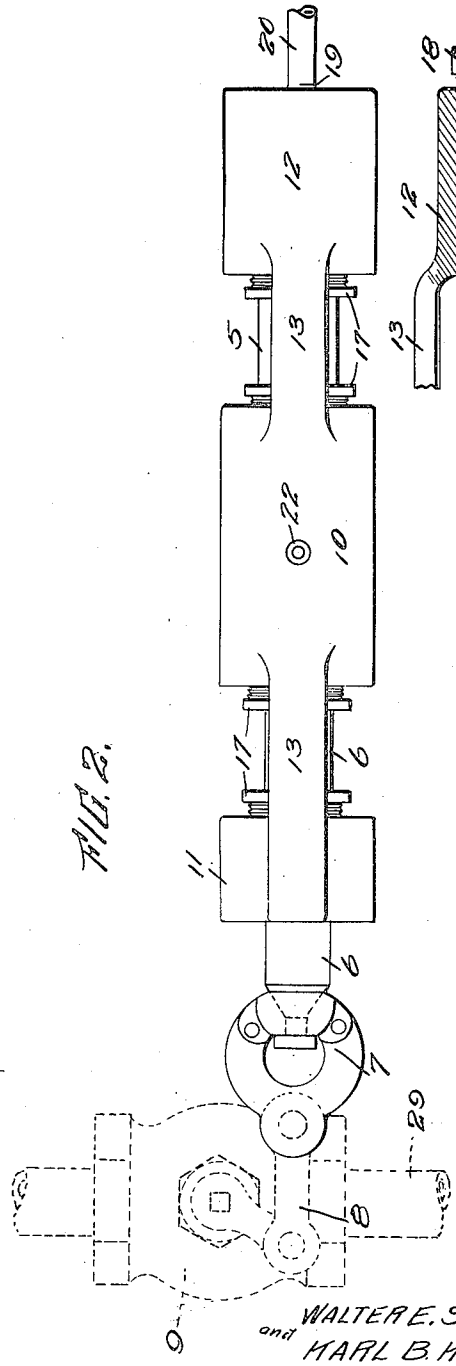


FIG. 2.

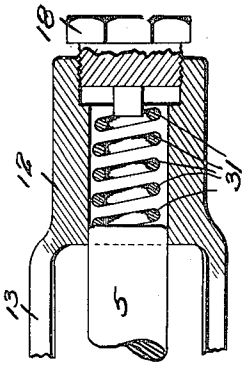


FIG. 4.

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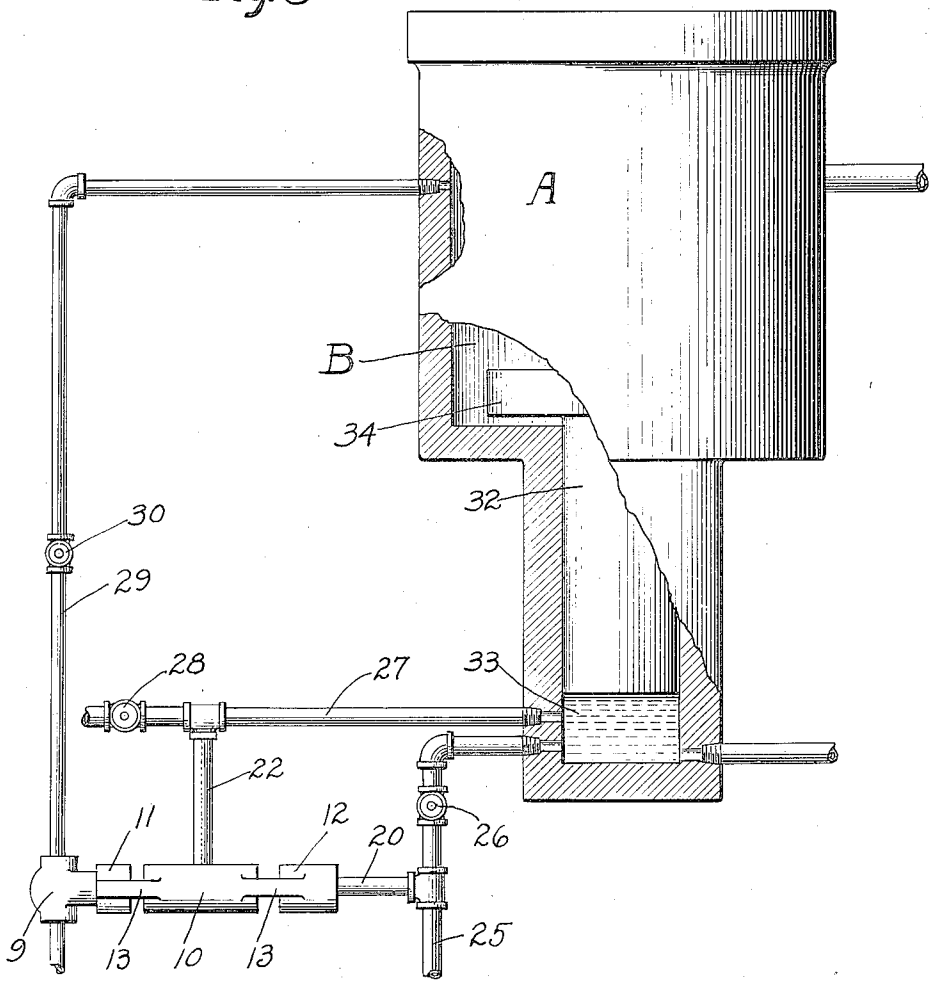
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Fig. 3



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UNITED STATES PATENT OFFICE.

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AUTOMATIC VALVE-CONTROLLER.

1,317,668. Specification of Letters Patent. Patented Sept. 30, 1919.

Application filed March 6, 1918. Serial No. 220,741.

To all whom it may concern:

Be it known that we, WALTER E. SHIVELY and KARL B. KILBORN, citizens of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented new and useful Improvements in Automatic Valve-Controllers, of which the following is a specification.

This invention relates to an automatic control device which is designed to prevent the premature opening of a valve or control element where a number of valves or control elements are used.

In connection with the art of rubber goods vulcanization, it will be understood that hydraulic presses are in almost universal use. Each of these presses includes a fixed head or a movable ram carrying a platen on which is placed a number of molds to be compressed against the fixed head by hydraulic power acting upon the ram. Steam is a much used agent for imparting the heats of vulcanization to the rubber goods contained in the compressed mold, while movement of the ram plunger is controlled by different water pressures.

The ordinary course of operation includes the loading upon the ram platen a number of molds by the operator, the ram being then raised by low pressure water acting in the ram pot, until the pile of molds is in contact with the fixed head of the press. At this time a relatively high pressure is caused to act upon the ram plunger in order to so compress the several molds against the press head that each pair of mold parts will be properly mated. At the same time that the compression of the molds is undertaken, steam is admitted to the press in order that the high temperature, required for vulcanization, may be secured.

In unloading a press, the operator must turn off the valve controlling the admittance of the high pressure water into the ram pot, and must also turn off the steam valve. The relatively low water pressure is then employed to raise or lower the molds, as the case may be, to the unloading point. It will thus be seen that the operator has, therefore, three valve movements to make since the high pressure hydraulic line and the steam valve should both be cut off when the valve of the low pressure line is opened, and vice versa.

In order to prevent the operator from turning on the steam valve before the high pressure line has been opened, we have proposed the device herein comprehended, whereby the valve may be retained in a closed or locked position until the correct control elements or valves have been operated.

As a principal object, we contemplate the provision of a valve-controlling device including a double acting piston which is controlled by the water pressures existing in the hydraulic press itself, such device being connected with a steam valve in such manner as to open this valve when the higher hydraulic pressure is used in the press and to close this valve when the lower hydraulic pressure or no pressure at all is used therein.

It is a more particular object of this invention to provide an automatic valve control device which includes a double acting piston, movement of which in one direction is controlled by the higher water pressures of the hydraulic press, while movement in the opposite direction is similarly controlled by the lower water pressures of the press, such piston being directly connected to the vulcanizing steam valve in order to open or close this valve in accordance with the water pressure operating upon the piston.

It is a further object of the invention to provide an automatic valve control device which includes an unbalanced piston carrying an axial valve control stem, such piston being operable upon by water pressures of different degrees for movement in its respectively opposite directions, and such piston also offering, to the flow of the hydraulic pressures, surfaces proportionate to the respective degrees of these pressures.

The above and additional objects of a similar nature, which will be hereinafter more specifically treated, may be accomplished by such means as are illustrated in the accompanying drawings, described in the following specification and then more particularly pointed out in the claims which are appended hereto and form a part of this application.

With reference to the drawings, wherein there has been illustrated a preferred embodiment of the invention as it is reduced to practice, and throughout the several views of which similar reference numbers designate corresponding parts:

Figure 1 is a longitudinal sectional view of the valve control device comprehended herein, illustrating also one form of valve in connection with which the device may be used;

Fig. 2 is a top plan view of the control device as connected to another form of valve element to be automatically controlled;

Fig. 3 is a diagrammatic view of the control device and showing its connection to a conventional vulcanizing apparatus; and

Fig. 4 is a detailed sectional view of a modified form of one end of our valve.

Although we propose to describe our present invention in such manner as will set forth its peculiar fitness and adaptability for use in connection with the valve elements of a hydraulic press, we wish it to be understood that the device herein disclosed is not necessarily restricted to this particular use, but is capable of being advantageously employed in any field in which an automatic operation of a valve device, or similar controllable element, is desired, in connection with other devices or elements upon the operation of which latter the first device is, in some degree, dependent.

A double acting unbalanced piston 5 forms the basic element of the control device, such piston being fitted with an axially alined stem 6, the free extremity of which may be directly connected in some such desirable manner as at 7 to the operating arm or arms 8 of the valve device 9 in the pipe 29 conducting the fluid to be controlled. In the embodiment shown the pipe 29 conducts steam to the heating chamber B of the press A, shown in Fig. 3.

The piston 5 is reciprocably mounted, together with its stem 6, in a three part casing made up of a central section 10 and two end sections 11 and 12, these latter being connected to the central section through the medium of a pair of diametrically situated straps 13. The piston 5 is slidably mounted within a bore 14 which extends through the end section 12 and partially through the central section 10 of the casing, while the stem 6 of the piston is similarly mounted to project through the end section 11 and into the central section 10. The bore 15 for the piston stem 6 is narrower than the bore 14 for the piston itself, as the latter is preferably of larger diameter than the operating stem to be carried thereby. Suitable packing material 16 is placed about the exterior of both piston and stem, in each of the housing sections in which such elements are operable. Packing sleeves 17 axially enter each of the housing sections and maintain the packing 16 in its proper place; the strap connections 13 between the central section 10 and the two end sections of the housing permitting free access for the placement or removal of these packing sleeves.

The bore 14 extends entirely through its end section 12 but is closed off by means of a threaded plug 18 which has a threaded aperture to receive the threaded extremity 19 of a hydraulic conductor or pipe 20. It is through this pipe that hydraulic pressures of a lower degree are permitted to enter the bore 14 and to act against the whole end face of the piston 5. This pipe 20 is connected back to the main source of supply 25 whereby the relatively low water pressure is conducted to the ram pot 33 of the hydraulic press A and is connected ahead of the press control valve so that the pressure is acting on the piston 5 at all times as clearly shown in Fig. 3.

We wish it understood that although we have illustrated and described a low fluid pressure operating against the end of piston 5 at all times, an expansion spring 31 (see Fig. 4) of the required strength can be supplemented and obtain the required results as will be apparent.

Leading into the bore 14, as the latter is conducted into the central section, is a duct 21, extending radially from the bore and providing a communication between the latter and the higher hydraulic pressure pipe 22, the latter having its extremity 23 threaded into the central section 10 at the mouth of the duct 21. It will be observed that, since the operating stem 6 of the piston is of smaller diameter than the piston itself, a small chamber 24 will be formed at the inner end face of the piston, permitting the pressure fluid entering into this end of the bore 14 to act against a partial end area of the piston 5. The pipe 22 is, of course, connected to the ram pot of the hydraulic press A and is always under the same pressure as the ram, as will be more clearly brought out.

It will be observed that the lower pressure water entering the piston bore 14 through the pipe 20 has the entire end face of the piston 5 to act against, while the considerably higher pressure water entering into the oposite end of the piston bore 14 through the pipe 22 has a smaller end surface of the piston against which to act. These two terminal piston areas are proportionate to the strength of the respective water presures entering at opposite ends of the bore 14 and the resultant forces in each end of the piston chamber or bore are thus capable of operating the piston in the required direction and overcoming the existing opposite pressure when brought into play at the proper time, as will be more clearly understood.

In Fig. 3 we have illustrated the control device and its connection to a hydraulic press A, conventionally shown. The press A is provided with the usual heating or vulcanizing chamber B, in which a ram 32 extending into a ram pot 33 to which fluid

(usually water) under pressure is conducted from the high pressure supply 27 and from the low pressure supply 25 by any suitable connection. The ram 32 is provided at its upper end with a ram platen 34 which supports the molds containing the articles to be cured, as will be readily understood by those familiar with the art. From Fig. 3 it will be observed that the low pressure pipe 20 is connected to the main supply pipe 25 anterior to the valve 26 which controls the low pressure fluid to the ram pot 33. The piston 5 is therefore under uniform pressure at all times. The pipe 22 is connected to the supply line 27 posterior to the valve 28 controlling the admission of the high pressure fluid, so that the chamber 24 is under the high pressure of said high pressure fluid only when the higher hydraulic pressure is in the ram pot 33. The steam valve 9, connected to the piston 5, is interposed in the main steam supply line 29 anterior to the operator's valve 30, so that steam cannot be admitted by the valve 30, until the higher hydraulic pressure is admitted to the ram pot 33, which higher pressure will open valve 9.

The operation of our device is as follows:

Assuming that the press has been unloaded or cleaned and refilled and that the piston 5 and valve 9 are held in their idle or closed position by the lower water pressure, the operator may close the press by opening valve 26 thereby causing the ram 32 to raise the platen 34 to a closed position and the valve 26 is then closed. Next, valve 28 is opened subjecting the ram to the required high pressure and at the same time opening valve 9 opening the steam to valve 30. The operator can then operate valve 30 and permit the vulcanization to proceed.

From the foregoing it will be readily seen that the operator can close the press with the lower pressure water but that he cannot then turn on the steam unless he first subjects the molds to the required pressure by means of the higher hydraulic pressure. Thus the present invention positively guards against the curing of rubber goods under a low pressure which would result in a defective product.

What we claim is:

1. The combination with a hydraulic press having a press element; a valve controlling the application of hydraulic pressure and thereby controlling movement and position of the element, and a steam valve to be controlled in conjunction with the movement of said press element, of a controller valve including a piston automatically operable in accordance with the movements of said hydraulic press element, and means carried by said piston for automatically controlling the movement of said steam valve in accordance with the movement of said piston.

2. The combination with a hydraulic press having a press element movable in two directions, a steam valve arrangement in conjunction with said press element, means of a hydraulic nature for moving said press element, a control valve including a piston movable in accordance with said press element and simultaneously therewith by the same hydraulic means and valve operating means carried by said piston and movable in accordance with the automatic control of said steam valve in correspondence to the movements of said press element.

3. The combination with a hydraulic press including a press element movable in two directions by hydraulic means, respectively operable upon said press element for movement thereof in the corresponding direction; a control valve including a double acting piston similarly operable upon by hydraulic means regulating movement of said press element, a steam valve to be controlled in accordance with the movement of said press element and means carried in axial extension of said piston to control said steam valve in accordance with the movement of said press element.

4. In an apparatus of the character described, a pipe for conducting a heating fluid to said apparatus, means for controlling the flow of said heating fluid, a source of fluid under pressure for operating said apparatus, said means being operated by the pressure of said pressure fluid.

5. In an apparatus of the character described, means for supplying a heating fluid to said apparatus, a pressure fluid supply for operating said apparatus, means for controlling said heating fluid, means for controlling said pressure fluid, and means preventing the operation of said heating fluid controlling means, without first operating said pressure fluid controlling means.

6. In an apparatus of the character described, means for supplying a heating fluid to said apparatus, a valve controlling the supply of said heating fluid, means tending to close said valve, a pressure fluid supply to said apparatus for operating the same, means connected to said valve and operated by said fluid pressure to open said valve.

7. In an apparatus of the character described, means for supplying a heating fluid to said apparatus, a valve controlling the supply of said heating fluid, a high pressure fluid supply to said apparatus, a low pressure fluid supply to said apparatus, and means connected to said valve and exposed at will to said high and low pressure fluids respectively, whereby said valve is opened by pressure of said high pressure fluid and closed by pressure of said low pressure fluid.

8. In an apparatus of the character described, a heating chamber, a heating fluid supply pipe leading to said chamber, a valve

in said pipe controlling the supply of said heating fluid, a casing connected to said pipe, a pressure fluid supply pipe leading to said apparatus and communicating with said casing, and means within said casing and connected to said valve, said means being exposed to said pressure fluid to be operated thereby.

9. In an apparatus of the character described, a heating chamber, a heating fluid supply pipe leading to said chamber, a valve in said pipe controlling the supply of said heating fluid, a casing connected to said pipe, a high pressure fluid supply pipe leading to said apparatus and communicating with said casing, a low pressure fluid supply pipe also leading to said apparatus and communicating with said casing, and means within said casing and connected to said valve, said means having portions thereof exposed respectively to said high and said low pressure fluids whereby the operation of said valve is dependent on the relative pressures of said fluids.

10. In a vulcanizing apparatus, a heating and vulcanizing chamber, a steam connection to said chamber, a hydraulic medium connection to said apparatus, a valve in said steam connection, a piston connected to said valve, said piston being operated by said hydraulic medium.

11. In vulcanizing apparatus, a steam heated hydraulic vulcanizing press, and means for admitting steam into the press operably dependent upon the pressure of a hydraulic medium in the press.

12. In vulcanizing apparatus, a hydraulic vulcanizing press having a steam connection and a separate connection for a hydraulic medium, and a valve in said steam connection having an operating member dependent for action upon said hydraulic medium.

13. A hydraulic vulcanizing press having a steam chamber provided with a ram, a steam supply pipe connected with said chamber having a main valve and a supplemental valve to control the admission of steam to said chamber, a pipe connection for said ram, means to control the passage of a hydraulic medium through said connection, a spring to close said supplemental valve, and piston means to open said supplemental valve deriving its operating power from the hydraulic medium.

In testimony whereof we have signed our names in the presence of two subscribing witnesses.

WALTER E. SHIVELY,
KARL B. KILBORN.

Witnesses:
BURGESS DARROW,
ELMER F. BRUNNER.